CLAIMS

1 An image information encoding apparatus adapted for blocking an input image signal to implement orthogonal transform thereto on the block basis to perform quantization,

the image information encoding apparatus comprising:

intra-image prediction means for adaptively changing block size on the basis of a chroma format signal indicating resolution of a color signal and a color space signal indicating color space to generate a prediction image in performing intra-image predictive encoding of the color signal;

transform means for performing, on a predetermined block size basis, integral transform of a difference signal between the prediction image generated by the intra-image prediction means and an original image;

quantization means for adaptively changing quantization technique in accordance with transform processing by the transform means to quantize transform coefficients generated by the transform means; and

encoding means for encoding the transform coefficients quantized by the quantization means, the chroma format signal and the color space signal.

2 The image information encoding apparatus as set forth in claim 1,

wherein the transform means further performs integral transform of blocks constituted by collecting only DC components after undergone integral transform on the predetermined block size basis.

3 The image information encoding apparatus as set forth in claim 2,

wherein the chroma format signal at least includes 4:2:0 format, 4:2:2 format and 4:4:4 format, and the color space signal at least includes YCbCr, RGB and XYZ.

4 The image information encoding apparatus as set forth in claim 3,

wherein in the case where the chroma format signal is 4:2:0 format, and the color space signal is YCbCr, the intra-image prediction means generates the prediction image on 8 × 8 pixel basis.

5 The image information encoding apparatus as set forth in claim 3,

wherein in the case where the chroma format signal is 4:2:2 format, and the color space signal is YCbCr, the intra-image prediction means generates the prediction image on 8 × 16 pixels basis in which blocks of 8 × 8 pixels are arranged in a longitudinal direction.

6 The image information encoding apparatus as set forth in claim 3,

wherein in the case where the chroma format signal is 4:4:4 format, and the color space signal is YCbCr, RGB or XYZ, the intra-image prediction means generates the prediction image on 16 × 16 pixels basis in which blocks of 8 × 8 pixels are arranged in longitudinal and lateral directions.

7 The image information encoding apparatus as set forth in claim 4,

wherein in the case where the chroma format signal is 4:2:0 format, and the color space signal is YCbCr, the transform means performs integral

transform of the difference signal on 4 × 4 pixel basis to further perform integral transform of blocks of 2 × 2 pixel units constituted by collecting transformed DC components.

8 The image information encoding apparatus as set forth in claim 7,

wherein when respective coefficients of the blocks of 2 × 2 pixel units are expressed as fdc2 × 2, respective coefficients fdc'2 × 2 after undergone integral transform of the corresponding blocks are represented by the following formula.

[1]

$$fdc'_{2x2} = T_2 \times fdc_{2x2} \times T_2^T$$
$$= \frac{1}{2}\begin{pmatrix}1 & 1\\ 1 & -1\end{pmatrix} fdc_{2x2} \begin{pmatrix}1 & 1\\ 1 & -1\end{pmatrix}$$

where

$$T_2 = \frac{1}{\sqrt{2}}\begin{pmatrix}1 & 1\\ 1 & -1\end{pmatrix}$$

9 The image information encoding apparatus as set forth in claim 5,

wherein in the case where the chroma format signal is 4:2:2 format, and the color space signal is YCbCr, the transform means performs integral transform of the difference signal on 4 × 4 pixel basis to further perform integral transform of blocks of 2 × 4 pixel units constituted by collecting transformed DC components.

10 The image information encoding apparatus as set forth in claim 9,

wherein when respective coefficients of the blocks of 2 × 4 pixel units are expressed as fdc2 × 4, respective coefficients fdc'2 × 4 after undergone integral transform of the corresponding blocks are represented by the following formula.

[2]

$$fdc'_{2x4} = T_{v(4)} \times fdc_{2x4} \times T^{T}_{h(2)}$$

$$= \frac{1}{2\sqrt{2}} \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & 1 & -1 \end{pmatrix} fdc_{2x4} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$$

where

$$T_{v(4)} = \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & 1 & -1 \end{pmatrix}$$

$$T_{h(2)} = \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$$

11 The image information encoding apparatus as set forth in claim 10, wherein the relationship between the fdc2 × 4 and the fdc'2 × 4 is approximated by the following formula.

[3]

$$fdc'_{2\times4} = T_{v(4)} \times fdc_{2\times4} \times T^{T}_{h(2)}$$

$$= \frac{1}{2\sqrt{2}} \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & 1 & -1 \end{pmatrix} fdc_{2\times4} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$$

$$\approx \frac{1}{4} \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & 1 & -1 \end{pmatrix} fdc_{2\times4} \begin{pmatrix} 1 & 1 \\ 1 & -1 \end{pmatrix}$$

12 The image information encoding apparatus as set forth in claim 6,

wherein in the case where the chroma format signal is 4:4:4 format, and the color space signal is YCbCr, RGB or XYZ, the transform means performs integral transform of the difference signal on 4 × 4 pixel basis to further perform integral transform of blocks of 4 × 4 pixel units constituted by collecting transformed DC components.

13 The image information encoding apparatus as set forth in claim 12,

wherein when respective coefficients of the blocks of 4 × 4 pixel units are expressed as fdc4 × 4, respective coefficients fdc'4 × 4 after undergone integral transform of the corresponding blocks are represented by the following formula.

[4]

$$fdc'_{4x4} = T_4 \times fdc_{4x4} \times T_4^T$$

$$= \frac{1}{4}\begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & 1 & -1 \end{pmatrix} fdc_{4x4} \begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & 1 & -1 \end{pmatrix}$$

where

$$T_4 = \frac{1}{2}\begin{pmatrix} 1 & 1 & 1 & 1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \\ 1 & -1 & 1 & -1 \end{pmatrix}$$

14 An image information encoding method of blocking an input image signal to implement orthogonal transform thereto on the block basis to perform quantization,

the image information encoding method including:

an intra-image prediction step of adaptively changing block size on the basis of a chroma format signal indicating resolution of a color signal and a color space signal indicating color space to generate a prediction image in performing intra-image predictive encoding of the color signal;

a transform step of performing, on a predetermined block size basis, integral transform processing of a difference signal between the prediction image generated at the intra-image prediction step and an original image;

a quantization step of adaptively changing quantization technique in accordance with transform processing at the transform step to quantize transform coefficients generated at the transform step; and

an encoding step of encoding the transform coefficients quantized at the quantization step, the chroma format signal and the color space signal.

15 The image information encoding method as set forth in claim 14,

wherein, at the transform step, integral transform of blocks constituted by collecting only DC components after undergone integral transform on the predetermined block size basis is further performed.

16 The image information encoding method as set forth in claim 14,

wherein the chroma format signal at least includes 4:2:0 format, 4:2:2 format and 4:4:4 format, and the color space signal at least includes YCbCr, RGB and XYZ.

17 An image information decoding apparatus adapted for decoding information obtained by implementing inverse quantization and inverse orthogonal transform to image compressed information in which an input image signal is blocked to implement orthogonal transform thereto on the block basis so that quantization is performed with respect thereto,

the image information decoding apparatus comprising:

decoding means for decoding quantized and encoded transform coefficients, a chroma format signal indicating resolution of a color signal and a color space signal indicating color space;

inverse quantization means for adaptively changing inverse quantization technique in accordance with the chroma format signal and the

color space signal to inverse-quantize the transform coefficients decoded by the decoding means;

inverse transform means for performing integral transform of the inverse-quantized blocks; and

intra-image prediction means for generating a prediction image in performing intra-image predictive decoding of the color signal at a block size corresponding to the chroma format signal and the color space signal by using an output signal from the inverse transform means.

18 The image information decoding apparatus as set forth in claim 17,

wherein the inverse transform means performs integral transform of the inverse-quantized blocks to further perform integral transform of the respective coefficients on the predetermined block size basis as respective DC components of blocks of a predetermined block size.

19 The image information decoding apparatus as set forth in claim 18,

wherein the chroma format signal at least includes 4:2:0 format, 4:2:2 format and 4:4:4 format, and the color space signal at least includes YCbCr, RGB and XYZ.

20 The image information decoding apparatus as set forth in claim 19,

wherein in the case where the chroma format signal is 4:2:0 format, and the color space signal is YCbCr, the inverse transform means performs integral transform of the inverse-quantized blocks of 2 × 2 pixel units to

further perform integral transform of the transformed respective coefficients as respective DC coefficients of four blocks of 4 × 4 pixel units which constitute block of 8 × 8 pixels.

21 The image information decoding apparatus as set forth in claim 19,

wherein in the case where the chroma format signal is 4:2:2 format, and the color space signal is YCbCr, the inverse transform means performs integral transform of the inverse-quantized blocks of 2 × 4 pixel units to further perform integral transform of the transformed respective coefficients as respective DC coefficients of eight blocks of 4 × 4 pixel units which constitute blocks of 8 × 16 pixels.

22 The image information decoding apparatus as set forth in claim 19,

wherein in the case where the chroma format signal is 4:4:4 format, and the color space signal is YCbCr, RGB or XYZ, the transform means performs integral transform of the inverse-quantized blocks of 4 × 4 pixel units to further perform integral transform of the transformed respective coefficients as respective DC coefficients of 16 blocks of 4 × 4 pixel units which constitute blocks of 16 × 16 pixels.

23 An image information decoding method of decoding information obtained by implementing inverse quantization and inverse orthogonal transform to image compressed information in which an input image signal is blocked to implement orthogonal transform thereto on the block basis so that

quantization is performed with respect thereto,

the image information decoding method including:

a decoding step of decoding quantized and encoded transform coefficients, a chroma format signal indicating resolution of a color signal, and a color space signal indicating color space;

an inverse quantization step of adaptively changing inverse-quantization technique in accordance with the chroma format signal and the color space signal to inverse-quantize the transform coefficients decoded at the decoding step;

an inverse transform step of performing integral transform of the inverse-quantized blocks to further perform, on a predetermined block size basis, integral transform of the respective coefficients as respective DC components of the predetermined block size; and

an intra-image prediction step of generating a prediction image in performing intra-image predictive decoding of the color signal at a block size corresponding to the chroma format signal and the color space signal by using an output signal of the inverse transform step.

24 The image information decoding method as set forth in claim 23,

wherein, at the inverse transform step, integral transform of the inverse-quantized blocks is performed to further perform, on a predetermined block size basis, integral transform of respective coefficients as respective DC

components of blocks of the predetermined block size.

25 The image information decoding method as set forth in claim 24,

wherein the chroma format signal at least includes 4:2:0 format, 4:2:2 format and 4:4:4 format, and the color space signal at least includes YCbCr, RGB and XYZ.